

Claims 3-13 are rejected under 35 U.S.C. §112, second paragraph and claims 9-13 are rejected under 35 U.S.C. §101. It is believed that the above amendment overcomes these rejections. In view of the amendment, it is believed that claims 4-6 and 9-12, which were indicated to have allowable subject matter, are allowable.

Claims 1-3, 7, 8 and 13 are rejected under 35 U.S.C. §103(a) over The Hashimoto et al publication (Properties of Perforated Trays Devoid of Downcomers) and Mitsuho et al "Handbook of Distillation Engineering."

In the BACKGROUND OF THE INVENTION section of the present specification, the prior art perforated tray towers without downcomer disclosed by Hashimoto et al and Mitsuho et al are described **including their problems**. More specifically, that section states:

in some cases, distillation of, for example, (meth)acrylic acid, using the conventional perforated tray tower without downcomer [as disclosed in the documents -- author] causes formation of a polymer which should be removed manually or chemically after suspension of the operation.

It is further explained that the conventional perforated trays without downcomer designed to address these problems **fail** to concurrently and surely produce both the **first state** where the inside of the perforated tray tower without downcomer is made wet with a liquid containing an easily polymerizable compound **and the second state** where gas and/or liquid currents are prevented from channeling and stagnating.

Therefore, it would not have been obvious to one of ordinary skill in the art to combine the descriptions in *Properties of Perforated Trays Without Downcomer* and *Distillation Engineering Handbook* and arrive at the present invention of a perforated tray without downcomer and the perforated tray tower without downcomer **which is capable** of concurrently and surely providing the **first state** where the inside of the perforated tray tower without downcomer is made wet with a liquid containing an easily polymerizable compound **and the second state** where gas and/or liquid currents are prevented from channeling and stagnating, **thereby preventing the formation of polymers with better efficiency**, and distilling an easily polymerizable compound in a stable manner over an extended period of time.

In other words, the perforated tray without downcomer and the perforated tray tower without downcomer of the invention has unique elements (values and conditions), as set forth in the claims, that are not taught nor would they have been obvious to one of ordinary skill in the art based on the cited prior art.

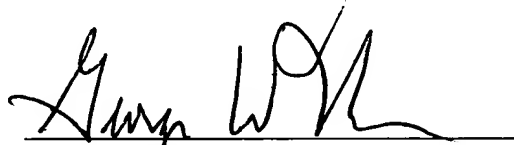
Included herewith is a marked-up version of the amendments to the subject application by the current amendment.

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Applicants believe that additional fees are not required in connection with the consideration of the within matter. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge Deposit Account No. **04-1105**.

Respectfully submitted,

Date: 11 Oct '02

A handwritten signature in dark ink, appearing to read "George W. Neuner", written over a horizontal line.

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE IN CLAIMS**

Please note that additions to the claims are shown underlined and deletions are shown in brackets.

1 (amended).        A perforated tray without downcomer provided with a plurality of holes, wherein

each of the plurality of holes has a diameter  $d$  in a range of from 10mm to 25mm,

each of the plurality of holes is separated from an adjacent hole by a center-to-center distance in a range of from  $1.2d$  to  $3d$ ,

the perforated tray without downcomer has a thickness in a range of from 2mm to 8mm, and

the perforated tray without downcomer has an opening ratio in a range of from 10% to 30%,

wherein multiple perforated trays without downcomer are used at the same stage in a perforated tray tower without downcomer, and the two most closely located holes of any respective adjacent perforated trays without downcomer are separated by a distance between 50mm and 150mm,

3 (amended).        A perforated tray without downcomer provided with a plurality of holes, wherein

each of the plurality of holes has a diameter  $d$  and is separated from an adjacent hole by a center-to-center distance in a range of from  $1.2d$  to  $3d$ ,

4 (amended).        A perforated tray tower without downcomer, comprising a plurality of perforated trays without downcomer disposed respectively at a plurality of stages, each of the plurality of perforated trays without downcomer being provided with a plurality of holes, wherein

each of the plurality of holes has a diameter  $d$  in a range of from 10mm to 25mm,

the perforated tray without downcomer has a thickness in a range of from 2mm to 8mm,

the perforated tray without downcomer has an opening ratio in a range of from 10% to 30%, and

each of the plurality of holes is separated from an adjacent hole by a center-to-center distance in a range of from  $1.2d$  to  $3d$ ,

wherein, [if one] when two or more of the plurality of perforated trays without downcomer are used at the same stage, the two most closely located holes that respectively belong to adjacent perforated trays are separated from one another by a center-to-center distance in a range of from 50mm to 150mm.

7 (amended). A perforated tray tower without downcomer, comprising a plurality of perforated trays without downcomer disposed respectively at a plurality of stages, wherein

the plurality of perforated trays without downcomer disposed respectively at vertically adjacent spacing have a blind ratio of at least 0.2 [or higher].

8. Cancelled.

9 (amended). A method of distillation, comprising the step of distilling an easily polymerizable compound or a liquid containing an easily polymerizable compound, using a perforated tray tower without downcomer, comprising a plurality of perforated trays without downcomer disposed respectively at a plurality of stages, each of the plurality of perforated trays without downcomer being provided with a plurality of holes, wherein

each of the plurality of holes has a diameter  $d$  in a range of from 10mm to 25mm,

the perforated tray without downcomer has a thickness in a range of from 2mm to 8mm,

the perforated tray without downcomer has an opening ratio in a range of from 10% to 300, and

each of the plurality of holes is separated from an adjacent hole by a center-to-center distance in a range of from  $1.2d$  to  $3d$ ,

wherein, [if one] when two or more of the plurality of perforated trays without downcomer are used at the same stage, the two most closely located holes that respectively belong to adjacent perforated trays are separated from one another by a center-to-center distance in a range of from 50mm to 150mm,

wherein an easily polymerizable compound or a liquid containing an easily polymerizable compound is distilled.

10 (amended). The method of distillation as defined in claim 9, wherein the distillation step is carried out under at least one of first and second conditions [is satisfied],

the first condition being such that an amount of wetting liquid with respect to a cross-sectional area of the tower is at least  $0.3\text{m}^3/\text{m}^2 \cdot \text{h}$  [or higher], and

the second condition being such that an amount of wetting liquid with respect to a sum of areas of the plurality of holes is at least  $1\text{m}^3/\text{m}^2 \cdot \text{h}$  [or higher].

11. Cancelled.

13. Cancelled.

14 (new). A method of distillation, comprising the step of distilling an easily polymerizable compound or a liquid containing an easily polymerizable compound, the compound being at least one compound selected from the group consisting of (meth)acrylic acid and esters thereof,

wherein a plurality of perforated trays without downcomer are disposed respectively at a plurality of stages, each of the plurality of perforated trays without downcomer being provided with a plurality of holes;

each of the plurality of holes has a diameter  $d$  in a range of from 10mm to 25mm;

each of the plurality of perforated trays without downcomer has a thickness in a range of from 2mm to 8mm;

each of the plurality of perforated trays without downcomer has an opening ratio in a range of from 10% to 30%; and

each of the plurality of holes is separated from an adjacent hole by a center-to-center distance in a range of from 1.2d to 3d.